

AMENDMENTS TO THE CLAIMS

The listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims

Please amend the claims as follows:

1. (currently amended) A differential load driving circuit comprising:

a plurality of power switches selectively coupled to a load ~~to~~ and for supply transferring power current to said load, wherein each power switch of said plurality of power switches is either fully on or fully off;

a plurality of power switch driving circuits ~~operable to control~~ for controlling the conduction state switching states of said plurality of power switches respectively and ~~to~~ for selectively couple coupling at least one power switch of said plurality of power switches to a PWM (pulse width modulation) signal so as to enable a PWM powering mode;

~~at least one linear~~ a first current source selectively coupled to said load and for supplying current to said load so as to enable a linear powering mode;
and

at least one current source switch ~~operable to couple~~ for coupling said ~~at least one linear~~ first current source to said load; and

a controller for controlling said plurality of power switch driving circuits and said at least one current source switch, and for either selecting said PWM powering mode in which said PWM signal controls said at least one power switch or selecting said linear powering mode in which said first current source supplies current to said load, and for controlling a switchover point between said PWM

powering mode and said linear powering mode according to a predetermined threshold to achieve a specified ripple current of said load.

~~wherein said linear current source is coupled to said load to deliver current to said load during low current conditions at said load, and said PWM signal coupled to said load to deliver current to said load during high current conditions at said load, wherein a switchover point between said linear current source and said PWM signal is selected to achieve a specified ripple current at said load.~~

2. (currently amended) A differential load driving circuit as claimed in claim 1, wherein said plurality of power switches ~~forming~~ form an H-bridge differential load driving circuit.

3. (currently amended) A differential load driving circuit as claimed in claim ~~[[1]]~~ 8, further comprising a second current source ~~two current sources~~, wherein said first current source supplies power to said load in said cooling mode, and wherein said second current source supplies power to said load in said heating mode ~~one said current source being coupled to said load during a first low current time period and the other said current source being coupled to said load during a second low time period.~~

4. (currently amended) An H-Bridge load driving circuit, comprising:

four power switches forming an H-Bridge circuit selectively coupled to a load and for transferring power to supply current to said load, wherein each power switch of said plurality of power switches is either fully on or fully off;

a plurality of power switch driving circuits operable ~~to control~~ for controlling
~~the conduction state~~ switching states of said four power switches respectively
and ~~to for~~ selectively ~~couple~~ coupling at least two power switches of said plurality
of four power switches to a PWM (pulse width modulation) signal so as to enable
a PWM powering mode;

at least one current source selectively coupled to said load and for
supplying current to said load so as to enable a linear powering mode; ~~an~~

at least one current source switch operable ~~to couple~~ for coupling said at
least one current source to said load; and

a controller for controlling said plurality of power switch driving circuits and
said at least one current source switch, and for either selecting said PWM
powering mode in which said PWM signal controls said at least two power
switches or selecting said linear powering mode in which said at least one current
source supplies current to said load, and for controlling a switchover point
between said PWM powering mode and said linear powering mode according to
a predetermined threshold to achieve a specified ripple current of said load.

~~wherein said H-Bridge circuit having a first mode in which said current~~
~~source is coupled to said load to supply current to said load and a second mode~~
~~in which at least two of said power switches are coupled to said PWM signal to~~
~~supply current to said load, wherein a switchover point between said first and~~
~~second modes is selected to achieve a specified ripple current at said load.~~

5. (currently amended) An H-Bridge load driving circuit as claimed in
claim 4, wherein said first linear powering mode comprises a cooling mode and a
heating mode, and wherein a direction of current flowing through said load in said

cooling mode is opposite to a direction of current flowing through said load in said heating mode is a low current mode and said current source supplies a linear current to said load.

6. (currently amended) An H-Bridge load driving circuit as claimed in claim 4, wherein said ~~second~~ PWM powering mode comprises a cooling mode and a heating mode, and wherein a direction of current flowing through said load in said cooling mode is opposite to a direction of current flowing through said load in said heating mode is a high current mode.

7. (currently amended) ~~An H-Bridge~~ A differential load driving circuit as claimed in claim 1, ~~comprising:~~ wherein said PWM powering mode comprises a cooling mode and a heating mode, and wherein a direction of current flowing through said load in said cooling mode is opposite to a direction of current flowing through said load in said heating mode.

~~four power switches forming an H-Bridge circuit selectively coupled to a load to supply current to said load;~~

~~at least one current source; and~~

~~at least one current source switch operable to couple said at least one current source to said load;~~

~~wherein said H-Bridge circuit is adapted to operate in a linear mode using said at least one current switch to enable said current source and a PWM mode wherein said switches are controlled with a PWM signal, wherein a switchover point between said linear mode and said PWM mode is selected to achieve a specified ripple current at said load.~~

8. (currently amended) ~~An H-Bridge~~ A differential load driving circuit as claimed in claim ~~[[7]]~~ 1, ~~wherein said linear powering mode comprises a cooling mode and a heating mode, and wherein a direction of current flowing through said load in said cooling mode is opposite to a direction of current flowing through said load in said heating mode~~ further comprising a plurality of power switch driving circuits operable to control the conduction state of said power switches and to selectively couple at least two of said plurality of power switches to a PWM signal.

9. (currently amended) ~~An H-Bridge~~ A differential load driving circuit as claimed in claim ~~[[7]]~~ 1, further comprising at least one filter circuit coupled between at least two power switches of said ~~four~~ plurality of power switches and said load.

10. (currently amended) ~~An H-Bridge~~ A differential load driving circuit as claimed in claim ~~[[7]]~~ 1, wherein said load comprises a thermal electrical cooler.

11. (currently amended) A differential load driving circuit comprising:
a plurality of power switches selectively coupled to a ~~thermal electric cooler load~~ and for transferring power to supply current to said load, wherein each power switch of said plurality of power switches is either fully on or fully off;
~~a plurality of power switch driving circuits operable to control the conduction state of said power switches and to selectively couple at least one of said plurality of power switches to a PWM signal;~~

~~at least one a first current source selectively coupled to said load and for supplying current to said load so as to enable a linear powering mode; and~~

~~a controller for controlling said plurality of power switches and said first current source, and for either selecting a PWM powering mode in which a PWM (pulse width modulation) signal controls at least one power switch of said plurality of power switches or selecting said linear powering mode in which said first current source supplies current to said load, and for controlling a switchover point between said PWM powering mode and said linear powering mode according to a predetermined threshold to achieve a specified ripple current of said load~~

~~at least one current source switch operable to couple said at least one current source to said load;~~

~~wherein said differential driving circuit has a first mode in which said at least one current source switch is enabled to couple said current source to said load to supply current to said load and a second mode in which at least two of said power switches are coupled to said PWM signal to supply current to said load, wherein a switchover point between said first and second modes is selected to achieve a specified ripple current at said load.~~

12. (currently amended) A differential load driving circuit as claimed in claim 11, wherein said plurality of power switches ~~forming~~ form an H-Bridge differential load driving circuit.

13. (currently amended) A differential load driving circuit as claimed in claim 11, wherein said first PWM powering mode comprising comprises a low

current mode in which ~~the~~ a direction of current through the said load defines a cooling mode.

14. (currently amended) A differential load driving circuit as claimed in claim 11, wherein said first PWM powering mode ~~comprising~~ comprises a low current mode in which ~~the~~ a direction of current through the said load defines a heating mode.

15. (currently amended) A differential load driving circuit as claimed in claim 11, wherein said second linear powering mode ~~comprising~~ comprises a high current mode in which ~~the~~ a direction of current through the said load defines a cooling mode.

16. (currently amended) A differential load driving circuit as claimed in claim 11, wherein said second linear powering mode ~~comprising~~ comprises a high current mode in which ~~the~~ a direction of current through the said load defines a heating mode.

17. (currently amended) A differential load driving circuit as claimed in claim 1, wherein at said switchover point, a load current ~~associated with~~ in said PWM signal powering mode is slightly less than a load current ~~associated with~~ in said linear ~~current-source~~ powering mode.

18. (previously presented) A differential load driving circuit as claimed in claim 1, wherein said specified ripple current is above zero.

19. (currently amended) A differential load driving circuit as claimed in claim 1, ~~further comprising:~~

~~- a controller operable to control said switch driving circuits and said current source switch,~~ wherein said controller comprises an input ~~representing~~ receiving said ~~crossover point~~ threshold.

20. (new) A differential load driving circuit as claimed in claim 1, wherein said controller further receives a feedback signal from said load for controlling power delivered to said load in both said linear powering mode and said PWM powering mode.

21. (new) A differential load driving circuit as claimed in claim 1, wherein said first current source is decoupled from said load in said PWM powering mode.

22. (new) An H-Bridge load driving circuit as claimed in claim 4, wherein said controller further receives a feedback signal from said load for controlling power delivered to said load in both said linear powering mode and said PWM powering mode.

23. (new) An H-Bridge load driving circuit as claimed in claim 4, wherein said at least one current source is decoupled from said load in said PWM powering mode.

24. (new) A differential load driving circuit as claimed in claim 11, further comprising: a plurality of power switch driving circuits for controlling switching states of said plurality of power switches respectively and for selectively coupling

at least one power switch of said plurality of power switches to said PWM signal so as to enable said PWM powering mode.

25. (new) A differential load driving circuit as claimed in claim 11, further comprising: at least one current source switch for coupling said at least one current source to said load so as to enable said linear powering mode.

26. (new) A differential load driving circuit as claimed in claim 11, wherein said controller further receives a feedback signal from said load for controlling power delivered to said load in both said linear powering mode and said PWM powering mode.

27. (new) A differential load driving circuit as claimed in claim 11, wherein said first current source is decoupled from said load in said PWM powering mode.